# MILLING PRACTICES AND SILVICULTURAL FACTORS AFFECTING FORESTRY IN BENTON COUNTY OREGON

by

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and

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# FOREWORD

Before presenting the data for this thesis, the authors wish to make known their realization of its lack of entirety. Each phase of both problems is of great enough magnitude in itself to warrant a separate study and thesis.

The problems treated in this thesis had their origin in "Suggested Points to be Covered by Study of Small Mills Cutting Second-Growth Douglas Fir, in a representative portion of Western Oregon," an outline sent to the Oregon State School of Forestry by the United States Forest Service Experiment Station in Portland, Oregon.

The writers, at the suggestion of Professor T. J. Starker, chose Benton County, Oregon, as their universe. Each mill in the county was visited and all available information possible collected on each. These data were obtained by general observations, conference with the mill owners, hired help, and business men of the community. The material collected is, in a few instances, incomplete because of the reluctancy of the mill owners to disclose certain facts concerning their establishment. The authors feel, also, that, in some cases, the data may be biased, although it has been the practice to obtain as authentic information as possible.

After collecting all pertinent data available con-

cerning the milling and logging operations, the writers conducted silvicultural studies and observations on logged and burned-over areas. Such observations usually consisted of plot sampling--all plots being mechanically located--on areas of different slope, aspect, and burned-over conditions. Notes were taken concerning slope, aspect, seed tree distribution, ground cover, burned condition, and grazing. Photographs were also taken when weather conditions permitted.

A great mass of information was assembled, and, because of its bulk, and in order to set it forth in the most concise manner, the more important of the points covered have been compiled into data sheets. These sheets are the only data presented in this thesis, although a few of the less important points have been covered in the discussion. In many instances, also, the authors have referred to the original notes for incidental points that were not common to all of the mills.

Because the economic phase, and the silvicultural phase, of milling and logging are so closely interrelated, the writers have very kindly been given consent to present a joint thesis on these subjects.

Some mill owners visited objected to the use of their names and the information given in a write up that was to be at the disposal of the public. Hence the writers have referred to the mills by numbers. The key to these

numbers is to be filed at the office of their major professor, T. J. Starker, in the School of Forestry, at Oregon State College, Corvallis, Oregon.

# SECTION I

# PRESENTATION OF DATA

# DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Location of Mill | When Started | Pond Facilities | Mill Machinery | Type of Power | Mill Capacity |
|---|---|---|---|---|---|---|
| 1 | S26 T10S R6W | 1935 | None | Single Circular and Trimmer | Boiler | 12M |
| 2 | R 8W S36 F13S | 1933 | Pond | Double Circular Headsaw Trimmer Edger | 50 h.p. Boiler & 60h.p.engine, Dutch Oven | 19M Per 8 hr. |
| 3 | 1 mile west Peavy Arboretum | 1930 | No Pond | 1 Double Headsaw 1 Cut-off Saw, Dead Rolls | Steam Boiler | 10-25M |
| 4 | Lewis-Burg | | 1/100 Acre | Double Circular 2 Trimmers 1 Edger | Boiler & Dutch Oven | 25M |
| 5 | Sec. 33 F. R. (4 mi. From Summit) | 2 yrs. 1934 | Yes | Double Headsaw Edger Trimmer | Boiler & Dutch Oven | 25M |
| 6 | Kings Valley | 1910 | Creek Dammed | Double Headsaw Trimmer Edger Planer | Boiler & Dutch Oven | 45M |
| 7 | Glen-Brook | 1934 | About 5 Acres | Double Circular Saws Edger Trimmer | Boiler & Dutch Oven | 25M |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Capacity Per Year | Maximum Log | Minimum Log | Defect | Principle Products | Number of Men |
|---|---|---|---|---|---|---|
| 1 | 3600M | 36" | 12" | Small | Ties & Planks | 5 |
| 2 | 5700M | Capable of 60" | 12" | 20% | Ties Rough Lumber Planks Struct. | 23 |
| 3 | 3000M & 7500M | Average 20" | 10" | Small | Bridge Plank, Dimension & Struc- | 8 |
| 4 | 7500M | 48" | 12" | None | Dimension Planks Ties | 12 |
| 5 | 7500M | 42" | 10-12" | 25% | Plank Ties, Dimension Material | 12 |
| 6 | 13,500M | 48" | 12" | 25% | No. 1 Common Planks Not much Struct. | 75 In mill & planer |
| 7 | 7500M | 48" | 12" | Small Amount | Ties Mining Timbers Planks Dimen. | 20 |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Average Wage | Milling Costs | Shipping Point | Market for Products | By-Products Market | Average Selling Price |
|---|---|---|---|---|---|---|
| 1 | $2.50 | Not Known | Kings Valley | Brokers | No Market | $11. |
| 2 | $3. | Ave. $2. | 15 mi. | Haage | Burn Sawdust & slabs | $10 in 1935 $13 in 1936 |
| 3 | $2.60 & up | Unavail-able | About 4 mi. (Lewis-burg) | Brokers Midw. East | Slabwood & Saw-dust Sold | |
| 4 | $3. | | Lewis-burg | Local and Brokers | Corval-lis Fuel | $13. |
| 5 | $2.50 & up | $1.65 | 4 miles Summit | Midwest | Sawdust Burned For Fuel No Mar. | $12 for No. 1 S43 Av. $9-M |
| 6 | 35¢ | Not Certain | Kings Valley | Midwest Brokers Chiefly | Sells Sawdust | Average $11 |
| 7 | 42½¢ Mini-mum | $2.50 | At hand (Glen-brook) | Brokers Midwest | Sells Slabwood Sawdust Used for Fuel | $10 & $14 per M |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Stumpage Price | Ownership of Land | Age of Stand | Distance from Mill | Mill Transportation | Logging Cost |
|---|---|---|---|---|---|---|
| 1 | $1 | Eastern Timber Company | Bastard Growth | ¼ to ½ mi. | Skids Direct | Not Known |
| 2 | Local 50¢-M Gov. $1.50-M | Farmers Gov. Speculators | Old & sec. Growth | ½ mi. | By Truck | $4 at Millpond including Stumpage |
| 3 | | Farmers & speculators | Second Growth | ½ mi. | By Truck | $3.00 Delivered |
| 4 | $4 | Buys on Mill Deck | | All Distances | By Truck | |
| 5 | $1 | Farmers & Speculators | Old & Second | 2000' | Sky Line Relay Gas Donkey | $5 |
| 6 | $1 | Owner | Second Growth | 2 mi. | By Truck | Total $5 at Mill |
| 7 | Not Available | Not Available | Second Growth | 1½ mi. | By Truck | |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Future Land Use | Owners' Experience | | | | |
|---|---|---|---|---|---|---|
| 1 | Not Certain | Worked at Logging & Milling | | | | |
| 2 | Grazing | Owner Logging & Milling All Life | | | | |
| 3 | Grazing | Business 6 or 7 Years | | | | |
| 4 | Not Certain | Six Years | | | | |
| 5 | Pasture & Reproduction | Efficient 8th gr. ed. Grown up With Bus. | | | | |
| 6 | No Provision | Started in 1911 Father in Bus. Before | | | | |
| 7 | Grazing & Reproduction | Learned Business from Ground Up | | | | |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Location of Mill | When Started | Pond Facilities | Mill Machinery | Type of Power | Mill Capacity |
|---|---|---|---|---|---|---|
| 8 | S10 T13S R6W | 1933 Moved 1936 | ¼ a. | Double Circular & Trimmer | Minneapolis Tractor (Inad.) | 12 |
| 9 | Between Wren & Kings Valley | 1935 | Creek Dammed | Double Circular Headsaw Edger Trimmer | Boiler | 25M |
| 10 | City of Corvallis | | Pond on Marys River | Double Circular Headsaw Carriers | Steam | 100M per 8 hrs. |
| 11 | R6W Sec. 15 & 22 T10S | 1/1/36 Recently Moved | In the Making | Rotary Headsaw Cut-off Saw & Edger | Old Road Machine Steam Boiler | 10M per 8 hrs. |
| 12 | T13S R 5W Sec. 15 | Renewed Operation 1936 | No Pond | Double Circular Head-rig Rolls & Chains | Two Large Boilers (Inad.) | 30M |
| 13 | S12 & 13 T13S R6W | 1935 Moved 1936 | None | Single Circular & Trimmer | Advenal Thresher Tractor (Ined.) | 12 |
| 14 | T14S R 8W Sec. 3 | Erecting 1936 | No Pond | Single Circular Saw Trimmer | Case Gas Tractor | 10M |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Capacity Per Year | Maximum Log | Minimum Log | Defect | Principle Products | Number of Men |
|---|---|---|---|---|---|---|
| 8 | 3600M | 48" | 12" | 5% | Planks & Ties | 12 |
| 9 | 7500M | 48" | 28" Ave. | High | Struct. Timbers Mostly Other Pro. cut. | 7 |
| 10 | 30,000M | | 24" | 10% | Struct. Timbers Dimens. Yard Stock | 93 |
| 11 | 3000M | 28" | 9" | Very Little | Car Material | 15 |
| 12 | 9000M | 4½' | Ave. 24-26" 12" | 5% | Dimens. Planks Ties Timbers | 26 |
| 13 | 3600M | 36" | 12" | 10% | Ties & Planks | 8 |
| 14 | 3000M | 30" | 12" | Small | Struct. Timbers Ties Rough Lbr. Dim. | 6 |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Average Wage | Milling Costs | Shipping Point | Market For Products | By-products Market | Average Selling Price |
|---|---|---|---|---|---|---|
| 8 | $3.-$4. | $2.-$2.50 | Green-Berry | Brokers to Mid-w. | No Market Burns | $11. |
| 9 | Code Wages | Would not Tell | 7 mi. Phil-omath | Brokers Mid-west States | Sells Sawdust No Mar. for Slabwood | $11.50 on Car |
| 10 | $.45 to $1.05 Per hr. | | At Hand Corv-allis | Foreign Coun. By Wholesa. | Sawdust Hog Fuel Slabwood Sold | $10. Per M for No. 1 Com. |
| 11 | | $1.50 | 6 mi. Wells | Brokers in Portland at 50¢ per M | Sawdust & Slabwood Are Sold | $13. Gets $11.50-$17. Per M |
| 12 | 12½¢ Per M | Just Begin-ning Operation | At Hand Green-Berry | Sells Thru Brokers | Burned Intends to Sell in Future | $14. Before Broker-age Com. 2x4 |
| 13 | $3.20 per Day | $[illegible]. Estimate | Green-Berry | Brokers | No Market | $11. |
| 14 | Not Running Yet | Not Known | Alsea 5 mi. | Brokers to Mid-west | None | Not Certain Yet |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Stumpage Price | Ownership Land | Age of Stand | Distance from Mill | Transportation to Mill | Logging Cost |
|---|---|---|---|---|---|---|
| 8 | $1. | Local | Second & Bastard | ¼ mi. to ½ mi. | Skids Directly to Pond | $3. |
| 9 | $1. | Farmers | Buys From Pri. Owners by M. & Lump Amt. | 2 mi. | By Truck | |
| 10 | $1.50 | Private Gov. & Speculators | Old Growth. | Average 10-15 mi. | Truck & Rail | |
| 11 | $1.50 | Clair | Second Growth | ½ mi. | Horses | $4. Per M |
| 12 | $1.25 Per M | Private Owners & Gov. | Some Old Growth Mostly Sec. Gr. | 6 mi. | By Trucks Ford V8 | $6.-M at Mill |
| 13 | $1. & Up | Local Farmers | Second & Bastard | Less Than ¼ mi. | Skids Direct | $3. |
| 14 | $1.25 | Local | Second Growth 60 yrs. | At Logging Operation | Direct Skid | Not Known |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Future Land Use | Owners Experience | | | | |
|---|---|---|---|---|---|---|
| 8 | Timber Land | Worked Around Mills & Logging All Life | | | | |
| 9 | Pasture | Grew up in Business Efficient | | | | |
| 10 | Grazing | | | | | |
| 11 | Grazing Small Part for Farming | Grew up In Lum. Game Little Ed. | | | | |
| 12 | Probably Grazing | In Business 12 yrs. Worked Up | | | | |
| 13 | Timber | Worked Around Mills & Logging All Life | | | | |
| 14 | No Provision | Worked at Logging & Milling | | | | |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Location of Mill | When Started | Pond Facilities | Mill Machinery | Type of Power | Mill Capacity |
|---|---|---|---|---|---|---|
| 15 | Woods Creek | 1933 | No Pond Could Easily Be One | Double Circular Headsaw Trimmer | Diesel Engine (New Waukasha Wessil.) | 10M Per 8 hrs. |
| 16 | 2 mi. West of Wren | October, 1935 | No Pond | Headsaw & Trimmer | Steam Boiler Feeds Slabs | 8-10M Per 8 hrs. |
| 17 | Short Distance W. of Monroe | 1935 | Creek Dammed | Sim. Cir. Headsaw Trimmer Edger Planer | Steam Boiler | 10-14M |
| 18 | Junction Yew & Alder Cr. On Newport Hy. | 1927 to Dec. 30, 1930 | Creek Dammed | Double Headsaw Trimmer & Edger | Steam Boiler | 35 & 40M Per 8 hrs. |
| 19 | 1 mile S.W. Blodgett | Last of 1934 | ½ acre Creek Dammed | Double Circular Saws Trimmer Edger | Steam Boiler | 20M Per 8 hrs. |
| 20 | | 1934 | Small (Creek) | Double Circular Headsaw Edger Trimmer | Steam Boiler | 20M Per 8 hrs. |
| 21 | R6W T10S S30 | Winter 1935 | No Pond At Mill | Double Circular Headsaw Trimmer Planer | Two Steam Boilers | 15M |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Capacity Per Year | Maximum Log | Minimum Log | Defect | Principle Products | Number of Men |
|---|---|---|---|---|---|---|
| 15 | 3000M | Average 20-24" | | Small Second Growth | 1x12 & 3x12 Plank Bridge Planks | 10 |
| 16 | 2400-3000M | Average 16" | | None | Mine Timbers & Rr. Ties Planks Dimens. | 7 |
| 17 | 3000 & 4200-M | | | Low | Bridge Planks Ties & Dimens. | 16 |
| 18 | 35 & 40M Per 8 hrs. | 36" Mill Now Abandoned | | | None | |
| 19 | 20M Per 8 hrs. | 4' | 12" Top Diameter | Small Amount | Bridge Timbers Other Heavy Timbers | 15 |
| 20 | 20M Per 8 hrs. | 48" | 12" | ? | Bridge Timbers & Small Dimension | 10 |
| 21 | 4500M | 48" | 10" | 50% in Old Growth | Rough Lub. Dim. Stock Planks & Ties | 12 |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Average Wage | Milling Costs | Shipping Point | Market for Product | By-Products Market | Average Selling Price |
|---|---|---|---|---|---|---|
| 15 | 35¢ Per M ft. Lumber Cut | $1.75 Calculated On Wages Fuel etc | 5 Miles | Broker | All Destroyed | |
| 16 | $2.50 Per 8 hrs. | Would not Tell | ¼ mi. | Brokers in Mid-west & Calif. | Sawdust & Slabs Sold for Very Little | Would Not Tell |
| 17 | $2.50 & Up | Unavailable | Short Distance | Broker in Eugene & Portland | Sells Sawdust to Monroe & Corv. | $8.50 for Rough Mst. $1. Planing |
| 18 | Mill Now Abandoned | | | | | |
| 19 | $2.80 to $3.40 | Not Known | 1½ mi. | Broker to Mid-west | Sawdust Is Sold & wood | |
| 20 | $2.80 To $3.40 | ? | 3 mi. | Broker | Burned | Not Available |
| 21 | 35¢ Per hr. | $2. | About ¾ mi. Hoskins | Sold By Brokers | Fuel for Steam Engines Rest Burned | $11. |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Stumpage Price | Ownership of Land | Age of Stand | Distance From Mill | Transportation To Mill | Logging Cost |
|---|---|---|---|---|---|---|
| 15 | $1. | Farmers & Speculators | 100 yrs. Old | 500 ft. | By 2 Ford V8 Trucks | |
| 16 | $1.25 | Belongs to Farmers & Bank | Second Growth | ¼ mi. | By Truck | |
| 17 | His Own Land & Timber On Farm | Owner of Mill | Second Growth | Short | By Horse-Skidding | $2.75 Per M |
| 18 | Mill Now | | 150 & 300 yrs. | Abandoned | | |
| 19 | $1.25 | | 50 to 100 yrs. Second Growth | ½ mi. | Truck in Poor Condition | |
| 20 | $1. | | Old & Second | ⅛ mi. | By Truck | |
| 21 | $5 Per M Logs at Mill & Stumpage | Owner of Mill | Both Old & Second Growth | Very Short 1000 to 1200 ft. | Gas Donkeys | |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Future Land Use | Owner's Experience | | | | |
|---|---|---|---|---|---|---|
| 15 | Grazing & Timber | Six or Seven Yrs. In Milling | | | | |
| 16 | Grazing | Owners Worked In Mills For yrs. Not Own | | | | |
| 17 | Sheep Pasture | Been In Business 15 Yrs. | | | | |
| 18 | No Provision | Previous Milling | | | | |
| 19 | Pasture | Careless | | | | |
| 20 | Timber | | | | | |
| 21 | No Provision | In Business 8 Yrs. Steady | | | | |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Location of Mill | When Started | Pond Facilities | Mill Machinery | Type of Power | Mill Capacity |
|---|---|---|---|---|---|---|
| 22 | T. 15 S. R. 8 W. | March 1 | None | Single Headsaw Trimmer | Boiler | Says 5M Estimate 3M |
| 23 | R. 6 W. T. 10 S. S. 34 | 1935 Spring | No Pond | Double Circular Headsaw & Trimmer | Steam Boiler | 15M |
| 24 | S. 33 T. 13 S. R. 6 W. | 1929 | Small Pond | D. Cir. Headsaw Trimmer Edger & Planer | Steam For Car. Tractor (60) for Planer | 25M Per 8 hrs. |
| 25 | R. 6 W. T. 14 S. Sec. Junctions 9, 10,15,16 | 1922 | Creek Dammed | Cir. Head Band Resaw Edg. Trimmer & Rolls | Steam Boiler & Dutch Oven | 50M Resaw 75M Headsaw |
| 26 | Cedar Creek | About July 1935 | Creek Dammed | D. Cir. Headsaw Edger Trimmer | Steam Boiler | 20M Per 8 hrs. |
| 27 | S. 31 T. 11 R. 7 W. | 1929 Not Operated Until 1932 | Small | D. Cir. Saws Trimmer Edger | Boiler | 10 to 15 M Per 8 hrs. |
| 28 | R. 7 W. T. 10 S. S. 12 | Being Started Jan. 1936 | No Pond | D. Cir. Headsaw Trimmer Edger | Steam Boilers | 10M |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Capacity Per Year | Maximum Log | Minimum Log | Defect | Principle Products | Number of Men |
|---|---|---|---|---|---|---|
| 22 | 1200M | | | None | Hardwood Lumber | 6 |
| 23 | 4500M | 48" | 12" | 30% | Plank Rough Stock & Mine Timbers | 18 |
| 24 | 7500M | No Check | | Small Amount | Dimen. Material Piling Planking & Boards | 17 |
| 25 | 15000M | 48" | 16" | Small Amount | Dimen. Material Piling Planking & Boards | 80 Logging & Mill Crews |
| 26 | 60,000M | 40" | 18" | 40% In Old Growth | Bridge Plank Decking & Struct. Timbers | 9 |
| 27 | 3000M to 4500M | No Limit | | Very Small | Bridge Timbers 3 x 12 Some Smaller | 15 |
| 28 | 3000M | 40" | 10" | ? | Plank Ties Rough Lumber | 6 |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Average Wage | Milling Costs | Shipping Point | Market for Products | By-Products Market | Average Selling Price |
|---|---|---|---|---|---|---|
| 22 | $3 Per Day | Mill Just Starting | Phil-omath | Shipped to Portland | Not to be Sold Burned as Refuse | |
| 23 | 35¢ Per hr. | About $1.20 Per M | Bren & Phil-omath | Brokers to Mid-west | No Sale Burned | $11 |
| 24 | $3.20 | No Check | | Sold Thru Brokers at Eugene | Not Utilized | $10 Per M |
| 25 | $3.96 Per Day With 8% Bonus | $2.50 | At Hend Dawson | Brokers to Mid-west | Sells Hogged Fuel Sawdust For Fuel | $12 & $13 |
| 26 | 37¢ Per hr. | $1.80 | 8 mi. | Corv-allis to Mid-west | Slabs & Sawdust Burned As Fuel Or Sold | $9 |
| 27 | $3.40 | Not Known | | Brokers to Mid-west | No Market Burns Slabs | |
| 28 | Not Started | ? | 3½ mi. Hoskins | Brokers to Mid-west | None | Not Started |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Stumpage Price | Owner Ship of Land | Age of Stand | Distance from Mill | Transportation To Mill | Logging Cost |
|---|---|---|---|---|---|---|
| 22 | | Farmer | Alder | Up To ½ mi. | Skidded Direct | Uncertain |
| 23 | $1. Per M | Local Farmers | Old Growth | 1 mi. | Skidded By Team | |
| 24 | $1. Per M | O & C Land | 75 to 300 yrs. | 1000 Ft. | By Ford Truck | |
| 25 | $1.50 | Mill Site Rented | Old Growth | Yarding 1500 ft. To R.R. | By R.R. | |
| 26 | Average $1 Per M | Belongs To An Estate | Both Old & Second Growth | ½ mi. | By Truck | $4.50 At Mill |
| 27 | $1. | | 50 to 75 yrs. (2nd) | 1500 ft. Yarding | By Truck | |
| 28 | $1. Per M | | | ½ mi. | Truck | |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Future Land Use | Owner's Experience | | | | |
|---|---|---|---|---|---|---|
| 22 | Probably Reforestation | Several Yrs. Running Shake Mill | | | | |
| 23 | Timber & Pasture | Previous Logging Milling Owned Mill | | | | |
| 24 | Grazing | In Lum. Bus All Life Little Edu. | | | | |
| 25 | Timber | Very Efficient | | | | |
| 26 | No Provision | Bus. All Life Little Ed. Knows Costs | | | | |
| 27 | No Provision | | | | | |
| 28 | No Provision | Worked at Logging | | | | |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Location of Mill | When Started | Pond Facili-ties | Mill Machi-nery | Type of Power | Mill Capa-City |
|---|---|---|---|---|---|---|
| 29 | R. 6 W. T. 11 S. S. 7 | June 1935 | Pond ½ A Board Dam Across Creek | D. Cir. Headsaw Trimmer & Edger | Steam Boilers | 12M Per 8 hrs. |
| 30 | R. 6 W. T. 11S. S. 6 | July 1935 | No Pond At Mill | D. Cir. Headsaw Trimmer & Edger | Two Steam Boilers | 20M Per 8 hrs. |
| 31 | S. 16 T. 13 S. R. 6 W. | 1936 | In Const-ruction | Double Headsaw Trimmer & Edger | 32-60 Cross Compound Engine | 20M |
| 32 | Sec. 16 T. 13 S. R. 6 W. | 1933 | None | Single Headsaw Trimmer | Diesel Motor | 12M |
| 33 | R. 6 W. T. 10 S. S. 23 | 1929 | Pond ½ A. Creek Dammed | D. Cir. Headsaw Trimmer & Edger | Steam Boiler & Oven | 25M |
| 34 | Blodget | 1931 | | Planer | Boiler | |
| 35 | T. 14 S. R. 8 W. S. 9 | 1936 | Plenty Storage Space | Singular Head rig Trimmer | 4 Cyl. Tractor Motor | 10M |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Capacity Per Year | Maximum Log | Minimum Log | Defect | Principle Products | Number of Men |
|---|---|---|---|---|---|---|
| 29 | 3600M | 36" | 10" | | Rough Plank Dimen. & Few Ties | 6 at Mill 4 or 5 In Woods |
| 30 | 6000M | 48" | 12" | | Dimen. Stock Planks 1" Lum. Few Ties | 10 |
| 31 | 6000M | 48" | 12" | 2% Small | Ties Planks & Rough Lumber | 16 |
| 32 | 3600M | 36" | 12" | Small | Ties Planks & Rough Lumber | 10 |
| 33 | 7500M | 48" | 11" | 10% | Plank Dimen. Stock & L. Grade Lumber | 20 |
| 34 | Planer | Planer | | None | Small Dimen. Bridge Timbers & Planks | 10 |
| 35 | 3000M | 36" | 12" | Not Known Yet | Plank Ties & Rough Lumber | 5 |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Average Wage | Milling Costs | Shipping Point | Market for Products | By-Products Market | Average Selling Price |
|---|---|---|---|---|---|---|
| 29 | $3.25 Per Day | $2.50 Per M | 5 mi. Hoskins | Sold Thru Brokers | Burned for Fuel | No. 1 Common $9.50 |
| 30 | 35¢ Per hr. | Little Less Than $2. | 10 mi. Hoskins | Brokers Monroe Lumber Co. at Eugene | Slabs for Fuel Rest Burned | |
| 31 | $3.20 | $2. | Green-Berry | Brokers to Mid-west | No Market | $10.50 |
| 32 | 35¢ Per hr. | $2.50 Per M | Green-Berry | Brokers to Mid-west | Give it Away | $11. |
| 33 | 35¢ Per hr. | Does Not Know | Kings Valley | Brokers to Mid-west | No Market Burns or Gives Away | $11.50 |
| 34 | $3.00 | Minimum | At Hand | To Mid-west | Planer | $14. |
| 35 | | Not Known Yet | Phil-omath | Brokers to Mid-west | | |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Stumpage Price | Ownership of Land | Age of Stand | Distance From Mill | Transportation To Mill | Logging Cost |
|---|---|---|---|---|---|---|
| 29 | $1 Per M Getting To Mill $3.50 More | Owner of Mill | Second Growth | ½ mi. | By Truck | |
| 30 | $1.25 | Local Farmer | Second Growth | ½ to 1 mile | By Truck Over Tramway | |
| 31 | $1. | Local | Second Growth & Bastard | ½ mi. | Truck | $3. |
| 32 | $1. | Local | Second Growth | ¼-½ Mile | Truck | $3.50 |
| 33 | $1 to $2 | Owner of Mill | Old Growth | 1½ mi. | By Truck | |
| 34 | P l a n e r | | | Various Distances | P l a n e r | |
| 35 | $1.25 | Local | Second Growth | At Operation | Direct Skid & Truck | |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Future Land Use | Owner's Experience | | | | |
|---|---|---|---|---|---|---|
| 29 | Thinks Used For Pasture | High School Edu. Several Yrs. Exp | | | | |
| 30 | For Goat Pasture | Worked in Saw Mill | | | | |
| 31 | Pasture | High School Edu. Several Yrs. Exp | | | | |
| 32 | Forest Land | Father Was in Business | | | | |
| 33 | Pasture | Previous Logging | | | | |
| 34 | Planer | | | | | |
| 35 | Grazing | Worked at Logging and Milling | | | | |

DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Location Of Mill | When Started | Pond Facilities | Mill Machinery | Type of Power | Mill Capacity |
|---|---|---|---|---|---|---|
| 36 | | April 1933 | Small Stream In Gully Dammed | D. Cir. Headsaw Edger Cut-off Saw | Steam Boiler | 20M |
| 37 | 3 mi. West of Corvallis | 1932 | No Pond | 2 Head-Saws Edger 2 cut-off Saws | Steam | 35M |
| 38 | Blodgett | Started since | study terminated | | | |
| 39 | Philomath. | Started since | study terminated | | | |
| 40 | Kings Valley | Started since | study terminated | | | |
| | | | | | | |
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DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Capacity Per Year | Maximum Log | Minimum Log | Defect | Principle Products | Number Of Men |
|---|---|---|---|---|---|---|
| 36 | 6000M | 48" | 12" | 25% | Planks & Ties | 20 |
| 37 | 7500M | 3 ft. | 14" | | Bridge Stringers Planking Dimen. | 27 |
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DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Average Wage | Milling Costs | Shipping Point | Market For Products | By-Products Market | Average Selling Price |
|---|---|---|---|---|---|---|
| 36 | 42½C To 55¢ Per hr. (.487¢ Average) | Does Not Know | 6 mi. Summit | Brokers To Mid-west Ch. 50¢ Per M | Burns Some For Power (No Market) | $9. |
| 37 | | $3. For Milling & Loading On Cars | At Hand | Calif. Texas Nevada Gov. Projects | Sells Sawdust & Slabs | No. 1 Common 343 Is $14. |
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DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Stumpage Price | Ownership of Land | Age Of Stand | Distance From Mill | Transportation To Mill | Logging Cost |
|---|---|---|---|---|---|---|
| 36 | $1. Per M | Farmers & Ranchers | Second Growth | 1000 ft. | Sky Line & Steam Donkey | Not Known |
| 37 | $1.25 Per M | Farmers & Speculators | 100-150 yrs. | 12 mi. | By Truck | $5.50 At Mill |
| | | | | | | |
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DATA SHEET FOR BENTON COUNTY MILLS

| Mill No. | Future Land Use | Owner's Experience | | | | |
|---|---|---|---|---|---|---|
| 36 | Grazing & Timber | Been In Business Since War | | | | |
| 37 | Grazing & Timber | Milling All Life Business For Self 5 yrs. | | | | |
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# SECTION II

# WOODS OPERATIONS

## INTRODUCTION TO ECONOMIC PHASES

In dealing with the economic phases of logging and milling in Benton County, the writers, of necessity, must touch certain angles of the problem superficially. Relatively little work has been done thus far by other authors along this particular line. It is reported that a similar, though more intensive, study of this kind was made in 1914 and 1915 by Austin Cary, then of the United States Forest Service, in Region Six. Mr. Cary, however, did not publish the results of his investigations.

The authors, then, in presenting the results of their study are not seeking to disclose subtle truth and underlying motives, but rather to reveal the problems and practices of the small mill owner as were seen by them, and to draw conclusions and recommendations from these.

Certain phases of the problem, such as Forest Taxation, are merely mentioned, because volumes have already been written on these subjects, and the writers consider them a study for experts along those lines.

In order that the results of the study may be presented in as orderly a manner as possible, the authors have chosen to start with the logging operation and follow the various steps through to the sale of the finished product. There will, of necessity, be a slight devia-

tion from this course, occasionally, in order that a related topic may be given a short discussion.

Provision for future use of the logged land. The statement of the Senate Document Number 12--Seperate Number 1--that probably less than five percent of the private cut-over land is logged with provision for the renewal of the forest, is clearly exemplified in Benton County. Very few owners have formulated a plan of any type for future land utilization, and plans that have been made are generally crude and not for the best benefits of the communities. Mr. Rosewarn, owner of the land cut over by mill number (30), states that he intends grazing his land intensively and burning it over frequently in order to keep the grass in good condition. An example of results of such practices can be seen in Figure (22). The residual stand of timber that was left on the area has all been killed by fire, a dense mat of nitrophyllos plants are coming in on the area, and already poison oak, hazel, and various other shrubs have covered the area so densely as to kill out the grass and prevent a regeneration of a future stand of timber. Many owners, with whom the writers talked, had similar plans for their land. In most cases, however, the land owners had made no definite provisions or had stated that the land would probably be used for grazing. Some owners stated that they could not afford to pay taxes and

that the land would probably be turned over to the county. (The problem of tax delinquent lands in treated more thoroughly later in this thesis.)

Slash disposal on the land. In all cases where slash is disposed of, such is done by means of broadcast burning. The cost of slash disposal is usually a small item, varying from $.02 to $.25 per acre. Where conflagrations develop, however, the costs may be high. Mill owner number (6) states that it cost him $1,600.00 to dispose of the slash on forty acres of land one year.

Beyond any doubt, some form of slash disposal is necessary on much of the forest land. However, indiscriminate repeated burning should be avoided. Many times the areas are reburned each time slash is disposed of on adjacent newly logged-over areas. Loggers have stated that this could easily and cheaply be avoided if they wanted to contend with the bother of checking the fire at the edge of the old burn.

Burning a factor in stream pollution. The indiscriminate application of the Oregon State fire law undoubtedly plays an important part in the depletion of aquatic life in the streams and rivers. Residents of Benton County state that streams which once afforded good trout fishing are now practically devoid of all fish life. Professor H. E. Dimick lays the cause of this largely to the practice of frequently burning-over

logged watersheds. Mr. Dimick states that water from burned-over areas has a different reaction from that flowing from a normally vegetated watershed. This is brought about by the leaching of ashes and may be such as to be directly inimical to fish life. Since the potential hydrogen content of the stream is changed, the balance of nature is overthrown, and many of the plants and small aquatic animals, which afford subsistence for fish, are unable to grow in the streams. The absence of vegetative cover permits a rapid unrestrained run-off, hence fluctuating water levels, another factor inimical to the welfare of aquatic life. The silt and organic matter carried by the rushing water from burned-over hill sides is also detrimental, since most of our native fish are unable to live in turbid water and water having a low oxygen content. The other aspects of erosion are treated elsewhere in this thesis.

Logging equipment. There are 14 operations in Benton County which utilize donkeys for handling logs in the woods. These donkeys are of all types and descriptions, varying from steam outfits to the most crude gas powered machines. One operation, number (27), is utilizing two donkeys in swinging their logs to the loading point. Both of these machines are home constructed and very crude at best. A Fordson tractor engine is used to power the donkey employed in yarding the logs

to the initial landing, and, from here, the logs are swung across the valley to a loading platform. The engine used for this purpose is powered by an old Reo truck motor.

In some instances, the logs are skidded by donkey from the woods directly to the log pond. This is the case with mill owner number (5), who, on January 4, 1936, had rigged up a combination skyline and highlead relay. Logs were skidded about 1500 feet to a tail spar; from there, swung down to the mill pond by another donkey located at the mill site. This type of operation is expensive because of the necessity of handling the logs so many times.

Logging at five other mills in Benton County is done with a combination of caterpillar tractors--twenties and thirties--and donkeys. Mill owner number (21), at Hoskins, states that during the summer, and on ground that does not have over 30 per cent as a maximum grade, he prefers the caterpillar because of its greater economy and flexibility. He states, however, that it cannot be used during the wet weather in the winter because of the mud. The caterpillar is slowed down enough by adverse conditions during these times to make it more costly than using a gas donkey.

Five mills are using either caterpillar tractors alone or combinations of horses and caterpillars. The

horses are used on topography too steep for the tractors. Logs are dragged to the canyon bottoms by horse and from here skidded to the log deck by the tractors.

On twelve operations only horses are used. It is interesting to note that, in general, the maximum skidding distance is½ mile or greater. In one case, mill number (23), the mill owner was contracting his logs to the mill for $4.00 per thousand board feet. The contractor was logging entirely by horse and paying $.75 per thousand board feet out of his $4.00 received for bucking and felling. This man, in February, 1936, was skidding direct over one mile distance to the mill. The contractor was unable to supply an adequate number of logs to the mill for sawing. Four teams were being used and a maximum number of trips per day was six, while an average was four to five. Horses were kept at the milling operation and feed was hauled up to them. The wages of the teamsters, also, had to be taken out of the $4.00 gross receipts. (The authors were unable to get the figure as to the wages paid teamsters.) The maximum load for the horses was about 400 board feet total. Assuming that the teamster's wage was as low as $2.00 a day, this would leave only $1.25 per thousand board feet, or $2.50 at a <u>maximum</u> per team per day. After deducting the feed bill from this amount, and without regarding the depreciation on the team and equipment, the contractor could not pos-

sibly have netted himself more than a mere subsistence wage.

As before stated, the mill owner was forced to run only part time because of an insufficiency of logs. The mill had a daily capacity of 15,000 board feet. Under the best conditions, an average maximum of not more than 8,000 board feet could be expected to be placed at the mill per day. This cut the output of the mill almost in half, and rather than a saving of money as was manifested by his contract price, the mill owner was making matters worse for himself and his employees. In the long run, he was losing much more money than he gained by his cheap logs.

Log loading devices. Gross inefficiency, as was typified in many of the milling and logging practices, was also manifested in a few instances in loading and unloading devices. Two mills, numbers (2 and 27), were using power from their donkey engines in loading with their swing yarder. The main line was temporarily hooked to the loading line which was dead-ended to a gin pole. A block, to which the loading chokers were fastened, rode on the loading line. The logs could then be lifted and lowered by running the main line out and in. The device, at best, was very crude. At the operation of mill number (2), a similar device was employed in loading logs. The authors noted that more than ½ hour's time was consumed

in loading a single truck with logs and that the services of three men were required. The logs could not be controlled and did considerable damage to the trucks upon which they were being loaded. On the other hand, at mill number (15), the writers noted that a single man drove his truck to the log loading rollway--the device employed for loading at this mill--rolled the logs on the truck, set the snubber blocks, and drove away in a little over ten minutes time. The truck body was not damaged by swinging logs, as in the case of the first example cited. A caterpiller tractor (twenty) was being used in this instance to skid the logs to the rollway loading dock.

From the woods to the mill. As before stated, a good many of the mill operations were located in close proximity to the logging operation. When this was the case, logs were skidded directly to the log pond or mill rollway. Two mill owners (25 and 10), hauled their logs to the mill by means of railroad. These two operations were the largest in the county, and the mills owned their own rolling stock. In all other cases, logs were hauled to the mills by means of motor trucks. Mill owners logging for themselves either owned their own trucks for transportation to the mill or contracted the hauling out to truck owners. Trem-ways for hauling were adequate except in one case (13). The owner had shown a lack of foresight in building ½ mile of trem-road to find out later that it was

too steep for a heavily loaded truck. The mill owner spoke of changing the road in order to allay this fault.

Unloading at the mill deck or mill pond was, in most cases, like loading at the woods--a laborious process. Getting the logs from the truck necessitated much prying and lifting with a cant hook or peavy. The trucker for mill owner (15) was forced to pry the log a height of almost two inches above the truck bed in order to get it to the log rollway. This represented much waste in time and energy. Foresight was displayed by one mill owner, number (12), in that his tram-way at the unloading point was built to incline toward the log pond; thus the logs would roll by themselves into the pond, as the truck was driven up to be unloaded. Two of the larger mills of the county used a gin pole unloader for getting their logs from the railroad car to the mill pond.

Waste in tram-way construction. Representing a large item of cost in logging and milling is tram-road construction. It is a cheap tram-road, indeed, that costs less than $1,000.00 per mile, and, where topography is rough, these costs may mount to several thousands of dollars. Yet, often times, after the logs have been removed, the road constructed for logging that particular section of land remains in the woods to rot while the mill owner saws new planking for another tram-way. The writers have noted several miles of such abandoned road throughout Ben-

ton County. It seems quite possible that the material in these abandoned tram-roads could have been used advantageously in future construction. Such use, undoubtedly, would be a saving over the cost of logging and milling new material. Figure ( ) shows a tram-way left in the woods to rot after the mill had been moved to a new location.

FIGURE 1

A tram road left to rot in the woods.
Logged over stand in the backgrounds.

# SECTION III

# MILLING

Log ponds and rollways. About 20 of the total mills visited in the county were equipped with log ponds. Logs for the other mills were either skidded directly to the log rollway from the woods, as was in the case of nine mills, or hauled by truck from the woods to the mill.

Probably the chief functions of a log pond are to provide an easy means of storage for a surplus of logs in order to insure continuity of milling operations and to wash the logs free from mud and gravel, thus facilitating sawing. The need for this was well manifested on several occasions. During a visit to mill number (15), January, 1936, the writers noticed several logs on the mill rollway that were covered with a coating of mud and gravel that was as much as an inch in thickness. The same was noted, as in the case of a visit to number (3). Sawing through this mud and gravel necessitated frequent shut downs and refiling of the head saws. This not only wasted time and lessened output but also increased the cost per thousand feet of lumber sawed, because most of the other work of the mill hinged directly on the operation of the head saw.

In January, 1936, the authors visited mill number (30) and found it not running. The owner explained its idleness by saying that, because of weather conditions and the distance skidding, they were unable to get logs to the mill as fast as they could saw. Likewise, when

FIGURE 2

Logs from the pond are washed free from mud and gravel. The typical log lift from the pond to the mill can be seen in the fore-ground.

the writers inquired as to the capacity of mill number (23), they were informed that the mill had a capacity of 15,000 board feet per day when they could get the logs to it. These conditions could have, undoubtedly, been partially averted had the mills been equipped with ponds for storage of a surplus of logs. No mill visited, aside from those equipped with ponds, had a log rollway, or other facilities for storage, capable of handling more than enough logs for one day's sawing, and the majority of the mills was equipped for storage only a few hours in advance of sawing. A break-down of either the logging equipment, or hauling equipment, thus necessitated a complete shut-down of the entire unit.

Sawing unwashed logs brings about an accident danger that is not incurred by sawing logs that have been through the mill pond. On a visit to mill number (16), it was noted that the men, especially the sawyer and ratchet setter, were being well spattered with mud and gravel each time the saw cut through the log. With no better protection facilities for the men than were there at this mill, a broken tooth from the saw or a particle of gravel shipped up by the saw from the unwashed surface of the log could easily cause the loss of vision in an eye of the sawyer, ratchet setter, or off-bearer from the head saw.

Log lifts from the pond to the log deck. Of all the mills having log ponds in Benton County, only two were e-

quipped to avoid troubles that might be incurred in skidding logs from the pond to the log deck. One of these mills was equipped with a jack chain for conveying the logs from the logs from the water, while the other used railroad irons, laid side by side and parallel with the direction of skidding, to reduce friction and wear on the log lift. These were desirable features for the reason that they bring about a conservation of power, a much needed conservation measure as will be explained later, and reduce the likelihood of a tie-up in mill operations. During the month of January, 1936, mill number (10) was forced to discontinue operations for almost a half day because the friction and wear of logs dragged up the log lift that was not properly reinforced had caused it to break through. No logs for sawing could be placed on the log deck; hence milling operations had to be shut down. One half day's shut-down in a mill of this size means a loss of almost 50,000 board feet of sawed lumber, aside from the cost of repairing the log lift and loss of wages to the men directly employed in milling.

In all but one mill visited, logs were dragged from the mill pond to the deck by means of a cable working on a revolving drum. The task of snubbing the cable around the end of the log was done by the pond men, who, in turn, usually followed the log up the incline and released and dragged the cable back to the pond, as the drum revolved

in the opposite direction. Since the services of one man are required on the pond, anyway, and, by the method employed, he was still able to supply an adequate number of logs to the deck, this practice cannot be discriminated against. In some cases, however, the power was not adequate for operating the log dreg in conjunction with the full use of the other power absorbing machinery.

Handling logs on the carriage. Except for the case of five mills in the county, logs were handled on the carriage by hand. In some cases they were rolled down a short incline to the carriage and pushed in place by the use of a cant hook and peavy. In many instances, however, the inclined rollway was not present and logs to be brought to the carriage were rolled by hand the entire length of the rollway--in mill number (37) this distance was almost 25 feet, although most commonly it was about 15 feet in length--and then placed on the carriage in the usual manner. Because of the long rollway and great amount of hand labor necessary at mill number (37), an extra man was employed on the rollway to assist in turning the logs and getting the logs placed on the carriage.

The ratchet setter on the carriage usually had charge of dogging the logs. Sometimes he also assisted in turning the logs. In one mill, number (12), two men were employed on the carriage.

In general, the process of handling the logs was very

time consuming and accompanied by much lost motion. One mill (2) had made use of the overhead log turner. This consisted of a log chain operating on an overhead drum. When it was necessary to turn a log in sawing, the ratchet setter could throw the end of the chain under the log from the outside, hook the end of the chain over the upper sawed edge, and the log would be turned by the chain's winding on the drum. The operator had become very adept at handling the chain, and the process of turning and redogging the log required only a few seconds. This mill was sawing old and bastard growth fir and because of the size of the logs handled had found such a device necessary for the conservation of time and man-power. The overhead log turner is one of the early types of power turning devices, and, although it is more or less obsolete and largely replaced by the steam nigger, it is still in occasional use (11).

In the three large mills of the county, numbers (12), 25, and 10), the logs were handled by means of either the friction nigger or the Simonson log turner. The smallest of the three mills (number 12), sawing 30,000 board feet per day, was equipped with the Simonson log turner, while the other two used the friction niggers. These devices are common to the more up-to-date mills, and need no comment.

Inadequate carriage clearance, a workmen's hazard.

In several instances, while visiting mills in Benton County, the writers noted that the mills were improperly laid out with regard to space, especially as pertains to adequate space needed for the operation of the carriage. In three cases, (mills number 29, 11, and 13), it was noted that the carriage deck was so close to the overhead rafters and braces that the man riding the carriage was forced to work in a stooped or squatting position in order to avoid striking his head on the braces as the carriage moved back and forth. This not only makes working conditions hazardous for the workman but also decreases his efficiency by distracting his attention and causing excessive strain and fatigue.

Sawing the logs. The double circular saw predominates in mills in Benton County. In only nine cases is equipment other than this used for the head saws, and in these cases the singular circular mill is utilized. Mill number (25) has a resaw of the band mill type, and number (6) has a circular resaw outfit. Twelve of the total mills visited consisted of only a headsaw plus a trimmer saw. There was no edger present. This necessitated doing all edging on the headsaw. Logs were sent through the head rig and the boards cut to the desired thickness and piled corresponding to their position in the log. After the last board was sawed from the log, the pile of boards was wheeled on dead rolls back to the fore side of the

FIGURE 3

The double circular head saw predominates in Benton County. A log carriage can be seen in the background.

saw, loaded on the carriage once more and run through again to be sawed to the desired widths. Occasionally, in order to save time, the entire pile of boards was edged in one operation. This necessitated setting the carriage to conform to the minimum width board and caused excessive waste on the wider widths. Some mill owners slabbed the entire log first and then cut the boards from the squared remainder. This necessitated turning the log three times before the actual sawing could begin. The operation, no matter how conducted was time consuming enough to almost cut the capacity of the mill in half. Hence the cost of milling per thousand feet was increased almost in direct proportion to the time consumed per thousand for sawing. In one case, 16, the slabs and waste were so excessive that handling them required the services of two men in operating the trimmer and conveying the slabs out to the waste chute. In mill number (37) one man is employed full time just for the purpose of cutting slashings into lengths at which they can be disposed. J. B. Cuno (13) states that in edging with the headsaw it is difficult to secure accuracy in width of boards and that much of the lumber is produced with fancy edges.

Handling equipment. In five mills of those visited in Benton County, man power is conserved by the use of live rolls in handling the slabs and edgings and off-bearing from the headsaw. In the others such material is

FIGURE 4

Lumber from the resaw in this mill is carried by live rolls to the green chain where it is sorted and graded.

handled by dead rolls. Mill number (23) conveys all slabs and edgings away be means of a push-cart. One man is employed for the sole purpose of loading slabs and edgings on a small cart, wheeling the cart 100 feet down the loading dock, and dumping them over the edge into a refuse pile where they are burned. This mill has a daily capacity of 15,000 logs when they can get the logs. There is no market for by-products; hence the extra man employed at the mill for disposing of slabs and edgings adds about $.20 per 1000 board feet to the cost of all lumber sawed.

The owner of mill number (8) has devised a slide by which he can convey slabs and edgings away from his mill. The mill proper is situated on the edge of a deep mountain ravine. A board slide, approximately 60 feet long and 10 feet in width and with a slope of about 80 per cent has been built from the edge of his line of dead rolls to within 30 feet of the creek bottom. Three strands of cable, to reduce friction, have been laid parallel to the length of the slide. Slabs and edgings are pushed from the dead rolls to the slide and sufficient momentum is gained by the time they reach the end of the slide to send them well into the creek bottom.

In all cases but one (15), sawdust from the head saw and trimmer saws and edgers was conveyed by means of endless belt or endless chain conveyors to the sawdust hopper

FIGURE 5

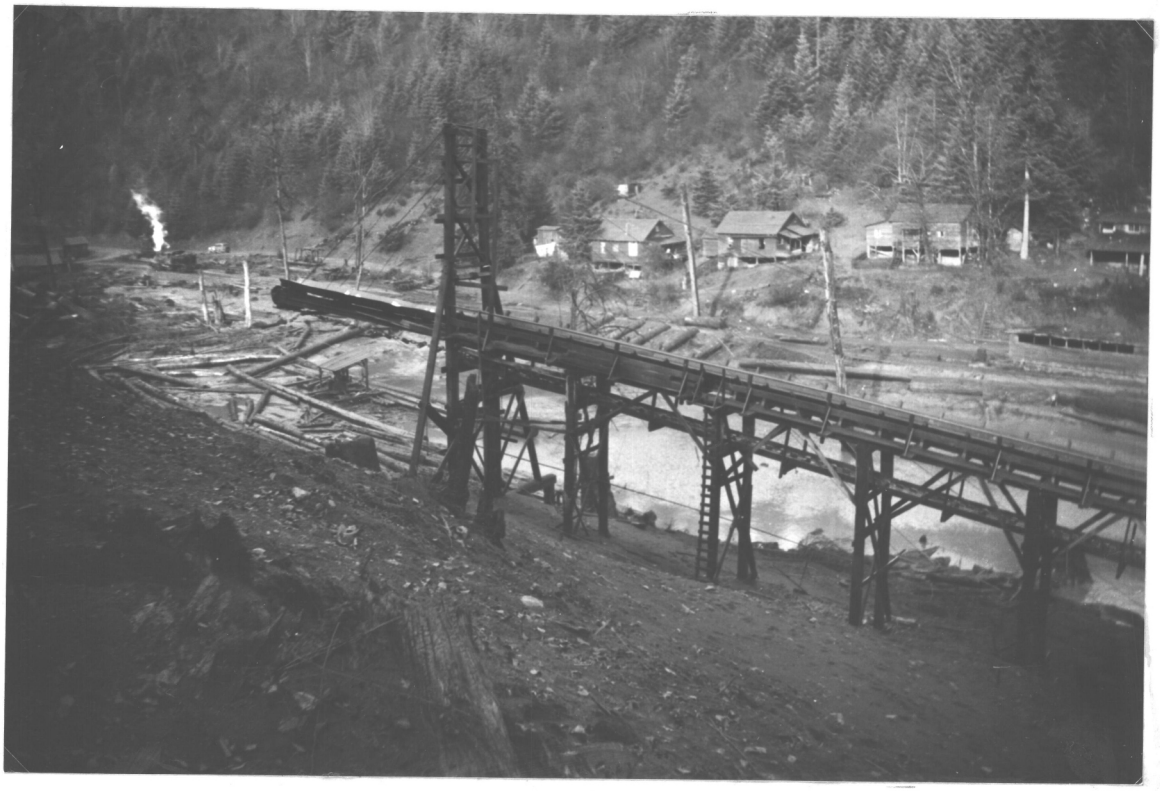
Where there is a market for by-products, the sawdust is conveyed by endless belts or chains, to the sawdust hopper. Note the homes of sawmill employees in the background.

or refuse pile--depending upon whether or not there was a market for by-products. Where dutch ovens are used in conjunction with the power boilers, a large portion of the sawdust was utilized here. This was the case of 10 mills throughout the county.

A unique device for conveying sawdust was utilized in mill number (15). A V-shaped trough formed by nailing two eight-inch boards together had been so laid out that it tapped the stream up the canyon slightly above the level of the sawmill floor. A short endless belt carried the sawdust from the head saw a distance of about 10 feet to drop it in the trough of running water. The water, in turn, carried the sawdust along the trough for a distance of about 150 feet down the canyon. The sawdust was deposited at the drop-off at the end of the trough. The trough was relocated when the sawdust piles became so large that there was no longer a drop-off at the end of the flume.

Mill waste disposal. Eleven mills in Benton County have a market for by-products--hogged fuel, sawdust, and slabwood. Waste materials in the other mills are conveyed out a short distance from the mill--usually to a creek bank--and piled. Generally the sawdust piles are burned; although, occasionally, no further attempt is made at disposal. Professor K. E. Dimick states that sawdust dumped into streams offers a source of mortality to fish life by

FIGURE 6



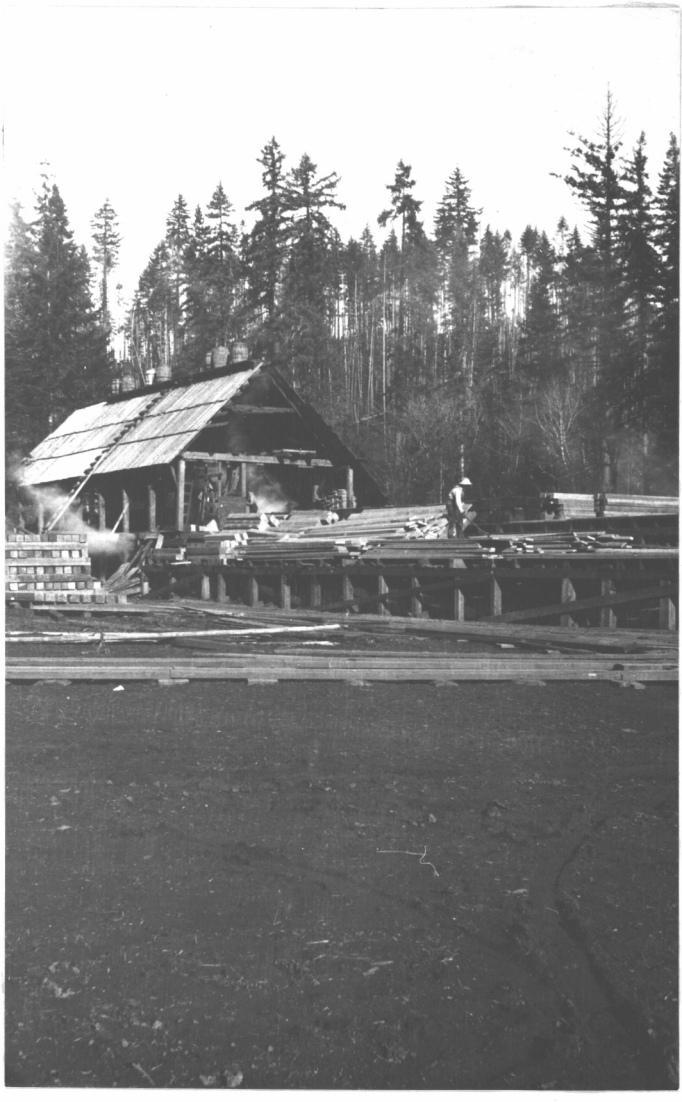
The refuse pile here is well isolated from the mill.

reason of its bringing about a mechanical injury to the gill tissues. Burned and leached chemicals from sawdust undoubtedly assist in changing stream reaction and overthrow the balance of nature.

Sawdust and hogged fuel from mills having a market for by-products are usually conveyed by endless chains to sawdust hoppers or, in the case where utilized in dutch ovens, directly to the fuel bin. In mill number (25) the millwright had devised a sorting screen for separating out fuels of different sizes and grades. The selling price of the fuel varied with the grade.

Burning refuse a fire hazard. The burning of refuse piles often constitutes a high fire hazard to the mill. The authors have in mind the case of two mills (15 and 23) in which the burning refuse piles were so situated as to burn into the timbers of the mill. In several other instances, refuse was so poorly disposed of that a fire could easily have started and spread to burn the mill down entirely. Mills number (25 and 2) have their burning refuse piles isolated by means of corrogated iron strips. Burning without this protection was the common practice among the others. Daniel F. Seerey (37) says a fire protection in the small mill: "There is little use in going to the expense of putting up a mill if it is allowed to burn down. Fire is an ever-present danger. For writing a policy on the ordinary small mill, fire insurance com-

FIGURE 7



A smaller mill of Benton County. Note the barrels of water for fire protection on the roof. Saw mill products are usually ties and bridge plank.

panies charge a premium equivalent to 20 per cent of the mill's value, which makes the expense of insurance prohibitive in most cases. It is up to the owner, then, to provide fire protection. This can be done by installing liquid chemical extinguishers or dry chemical extinguishers or water hose that can be attached to the boiler." Most of the mill owners in Benton County do not carry insurance on their establishment, and, likewise, most of them do not take special fire precaution measures. Four mills in the county, however, guarded carefully against fire's breaking out. Special precautionary measures taken were such as the installation of hydrants, watchmen, barrels of water on the roof, fire extinguishers, "no smoking" signs, plus free water in the log ponds. Sixteen mills had only log ponds to dip water from in case of fire, and seventeen mills had no fire protection facilities at all.

Power plants in the mills. Four mills (32, 15, 35, and 14) in Benton County were powered by means other than steam. Of these four, two (32 and 15) were powered by Waukesha Wessilman Semi Diesel engines, mill number (35) by an old four-cylinder tractor motor, and the other (14) was powered by a gas Case Motor. Of the remaining mills, 10 were powered by means of boilers plus dutch ovens, and the others by steam tractors or boilers. In eight cases (14, 35, 12, 13, 27, 2, 30, and 8) it was definitely noted by the writers that there was an inadequacy of power for

operating the milling machinery. In these cases, the head saw afforded such a drain on the power that it was necessary to halt the carriage occasionally on its trip into the saw in order that the engine could regain speed enough to saw properly. At mill number (2) it was noted that the power was inadequate for operating the log drag in conjunction with the full use of other power absorbing machinery.

Mill number (12) had a pond and head saw machinery that were adequate for a 75,000 board feet per day output. Because of inadequate power, however, the mill was sawing at a rate of 30,000 feet per day. Adequate power and the installment of an additional green chain for taking care of the manufactured products could have increased the output of this mill by two and one half times. The owners of other mills having inadequate power did not know the probably maximum capacity of their mills, but logic tells us that, since the cost of man-power is the largest item of the small mill, an additional output per man hour will proportionately decrease the cost of lumber per thousand.

The cost of milling. Daniel F. Seerey (37) states that the most important step in operation of a sawmill is the opening of a simple set of books in which is recorded faithfully the cost of everything relating to the business. "In the absence of such a record, an operator is sailing

on an unknown sea without a chart or compass." The number of "lost mariners" in Benton county is many.

Less than half of the small mill owners in Benton County were able to quote costs. Many kept no books at all, and the larger majority of those who could give costs of their various operations either were contracting their work at fixed prices or figured only the labor and other direct out-of-pocket expenses. Depreciation of machinery and equipment were not considered. One mill owner (2) stated that depreciation was such a small item that he did not try to keep an account of it.

The few mill owners who did keep accounts of the various receipts and expenditures of mill operations and related fields were very conscientious about it and had very detailed accounts. The efficiency of these mill owners who kept books was also generally otherwise typified. The mill layout, and logging procedures were orderly, refuse was generally disposed of in a safe manner, the mill yard was usually clean, and the men were safe-guarded against accidents.

Handling lumber in the yards. Most of the mills in Benton County store only a very small amount of lumber in their yards. In the majority of the cases the maximum amount is less than 100,000 board feet. In a few instances, however, (26, 10, 5, and 24) the amount stored exceeds this considerably. C. C. Crow, editor of "Crow's Lumber

FIGURE 8

Loading platform and planing mill showing the storage sheds for finished products. Note the overhead blower for conveying shavings to the power plant.

Digest" in Portland, Oregon, states that the small mill is generally under-financed and must sell his products as he manufactures them in order to meet his overhead expenses. The small mill owner is not equipped with working capital to finance yard storage and seasoning. In all but one instance, where seasoning and storage were done in the mill yards, facilities for this purpose were poor. Koehler (27) states that the ideal seasoning yard should possess the following qualifications:

1. The storage yard should preferably be on high ground.
2. Storage over black soil should be avoided. The yard should preferably be on a gravel or cinder foundation.
3. The yard should be clean and free from all rotting timbers.
4. Weeds and other forms of vegetation should be kept out to insure low humidities and good air circulation.
5. The yard should be located away from other objects or physiographic features that might hamper air circulation.

Only one storage yard (10) in Benton County possessed all of these qualifications. The others possessed none of them. One mill (25), however, had a large loading and storage platform with sheds for care of his finished lum-

ber. In this respect, his storage facilities were very creditable. As regards storage facilities for unfinished lumber, this mill ranked with the lowest. Lumber was stored on a small flat through which flowed a creek. Occasionally, during periods of excessive precipitation, this flat is subject to overflow by water from the stream. A rank growth of weeds and brush occupied areas not covered by lumber piles, and the loading dock itself surrounded the piling yard in such a way as to shut off circulation. Because of these factors, the yard is kept in a constant humid condition, a qualification optimum for the growth and spread of wood rotting fungi. No effort for keeping sanitary conditions in the yard were apparent.

In general, the above stated conditions prevailed in all of the lumber storage yards in Benton County. This typified either gross inefficiency on the part of the owners or a lack of an understanding of the principles of air-drying lumber. J. B. Cuno (13) states that the average small mill owner does not know how to stack and season his lumber properly. This is probably more nearly a solution to the problem than is a lack of efficiency, for rot is generally apparent, and it is not likely that a conscientious mill owner would permit its eating into his profits if he is acquainted with methods of prevention.

Mill number (10) kiln dries about 25 per cent of the

lumber produced. According to the manager of the concern, lumber from the kiln finds a higher market than that which is undried. Also, he states that the saving in freight rates by reduction in weight of material shipped more than pays the expense of kiln drying. All material that is sent through the planer is kiln dried first. This insures easier working of the material and a uniformity in size of products.

The writers have talked to several mill owners in the county about the possibilities of kiln establishment in their plants. The mill owners, however, felt that kilns were for the larger mills and could not be handled to an advantage in the small concerns. Mr. Johnson in January, 1936, stated that cheap kilns entirely within reach of the small mill owners could be constructed from lumber. These, he felt, could be operated to an advantage. Mr. Johnson informed the writers further that he felt a cooperative kiln of a larger capacity could be constructed for the use of five to six mills of a given community. If one large mill with its higher overhead can set up a kiln and profit from drying its products, it seems logical to suppose that several smaller well-established mills could cooperatively afford to operate a kiln.

Supervision of help in the mill. Daniel P. Seerey (37) states that "the mill man who neglects to supervise his operations rigidly is surely preparing a way to fin-

ancial disaster. An operator usually works hard at some particular job, such as sawing, and leaves the rest of the work to run itself. His proper place is "bossing the job" and if he does this thoroughly, he will have his hands full. In order to instruct men in the woods work, the operator must understand it himself. If he lacks this knowledge it would be wise for him to keep out of the portable mill business, or hire a competent man to run it for him."

Seven mill owners in Benton County (5, 18, 6, 31, 10, 4, and 25) did not actively participate in work at the mill or woods operation. These men corroborated D. F. Seerey's statement by saying that they had all they could do in keeping the men busy and doing the work as it should be done. The other thirty mill owners of the county took active part in mill work and trusted to luck that activities other than their own would progress smoothly. Usually the mill owners acted as head sawyer, or filled some such other important position.

All of the mill owners questioned had had woods experience of some kind previous to their entering the milling business. Some stated that they had worked in sawmills all of their lives, others had worked on logging operations, and a few had had only five or six years total experience. The average mill owner possessed only a grammar school education. Much of the experience that had been gained by the mill owners had been along the lines of

general mill or logging work such as could be handled by almost any inexperienced man. Thus, in total experience that would be a great asset in conducting a business in milling or logging, the average mill owner was relatively inexperienced. It is logical to suppose that inadequate insight into the field of business into which they enter and improper supervision of their laborers are probable factors contributing to the high per cent of business failures among small mill owners.

The marginal log of the small mill. Over thirty of the mill owners in Benton County did not know what was meant when they were asked what they considered their marginal log. When an explanation was made almost a unanimous answer was "oh, anything that will saw out lumber," or "anything that will make a tie." One mill owner, number 37, can be quoted as saying that he felt he wasn't making money on any log less than 16 inches in diameter; yet figures from a study by Dennis and Ulrich (unpublished report) show that a log as small as 8 inches was passed through this mill. This study also shows that of 130 logs run through the mill while under observation, the greatest number were 18 and 19 inches in size. In fact, approximately 25 per cent of the logs were grouped around these two diameter classes. The arithmetic mean of the logs taken through the mill in 130 samples is 19.03 inches in diameter and with a mean deviation of 3.27 inches.

Studies by Dennis and Ulrich, while not being of a large enough universe to be conclusive, point to a 24-inch log as being of an economic size for the mill in question. In other words there is a greater output in board feet per unit of time employed in sawing the 24-inch log than any other size. (The authors have taken average time for each log class and calculated it into the volumes of logs of that diameter class on the basis of the international rule--20 feet is used as the average length of log as this was the average length of logs taken through the mill.) These conditions, of course, hold true only for this particular mill of 15,000 board feet capacity. The data are enough to indicate that in this mill the average log sawed is five inches smaller than the optimum size for sawing, or stating it in another way, the log sizes sawed should be distributed around the average of 24 inches rather than 19 inches. This indicates roughly, too, that, since the universe is evenly distributed around a mean of 19 inches rather than an optimum of 19 inches, the marginal log should probably be proportionately higher than the smallest log sawed. In other words, it is probable that the marginal log for the mill number (37) is 15 or 16 inches in diameter rather than the 8 to 10 inches diameter being taken at present.

The effect of this small size of logs handled is the woods and sawed at the mill is obvious. It not only costs

more to operate in small timber but small timber produces narrower widths and cheaper grades of lumber. These grades are the most costly to produce, sell at lower prices, and are the slowest selling products.

W. W. Ashe (1) states that, in felling and bucking, the man capacity is nearly twice as much in working up trees having a 20-inch diameter than as it is in working up trees with an 8-inch diameter. He further states that it requires three times as long to skid 1000 feet of lumber in logs of 8-inches diameter as it does to skid the same amount in logs of 20-inches diameter. This proportion holds true practically irrespective of whether skidding is by cable or team.

In dealing with transportation and milling, Mr. Ashe declares that a car loaded with 10-inch logs had a capacity of 1150 feet mill cut, while a car load of 20-inch logs sawed out 3220 board feet, or nearly three times as much. It required four times as long to load 1000 feet of 10-inch logs as to load a car of 20-inch logs.

In milling, the average band mill requires twice as long to saw 1000 feet of lumber from logs with an 8-inch diameter as from logs which average 20 inches in diameter, or, in other words, a mill sawing 8-inch material cuts its capacity in half. It is easy to see from these data the great importance of knowing the marginal log.

No studies for determining the marginal log have been

made by any of the mill owners in Benton County. All mill owners, however, had a minimum sized tree to leave in the woods. This figure of minimum size was based on whether or not any sawed products could be taken out of the log rather than upon a monetary gain.

Probably accounting in a large measure for the subsistence of a few of the small mills in Benton County is the practice of contract logging. Twelve of the mills are getting their logs on the "gypo" basis, and, in the majority of the cases, the mill owners are paying $4.00 or less per 1000 feet for the logs delivered at the mill. Contractors, like mill owners, are dealing in diameter classes that deduct rather than add to their profit. They, like the mill owners, also, feel that anything that can be sawed into lumber is worth taking out of the woods. When such devices as a gin pole loader rigged in conjunction with the mainline of a high lead logging system are used, (a very slow and inefficient system at best) the cost of handling such small logs undoubtedly almost absorbs the entire margin for profit.

Many mill recently established. During the year of 1935 and thus far in 1936, twenty mills have started operation in Benton County. Nine of the mills that were established in 1933 and 1934 are still in operation. One mill that started in 1933 is still operating. If any mills were established in 1931 in this county, none sur-

FIGURE 9

This mill has been running since 1912

vived. One mill still exists from 1930, and three from 1929, although they run only intermittently and have lost on the average of three years out of the six years time since establishment. One mill still survives from 1928, and the other three were established years earlier than this date. (The above given figures are correct to February 28, 1936. The writers have been informed of two new mills that have started operation in Benton County since that date. April,1936.) In summary, these figures show that over 75 per cent of the present number of mills in Benton County have been established within the last three years. Probably an equal number was started during the boom periods of 1928 and 1929, and these four surviving are the only ones which have weathered through. The writers have no data to corroborate this last assumption, however. Some of the recently established mills have changed ownership twice in the last three years.

A prominent Portland editor, who has been associated with the milling business for years, stated (February 8, 1935) that 75 per cent of the small mills that start up go broke and close out of business within three years or less time after starting. The reasons for this were stated as follows:

1. The small mill is usually under financed.
2. The small mill owner usually does not know his limitations, but strives, rather to expand his

mill into milling materials that his plant is not capable of handling.

3. The small mill owner generally has an insufficient background in the milling business.
4. Generally, the small mill owner is not an efficient business man.

The editor stated that, since the small mill often produced and profitably sold lumber at a price less than the larger mills paid per 1000 board feet for logs, they must cut the type of products that affords them the cheapest output costs. "The reluctance to know and abide by this limitation whips nine out of ten of the small mills."

J. B. Cuno (13) states the following facts which corroborate statements made previously.

1. A high percentage of operators who take up the small mill business fail miserably.
2. A higher percentage earn just about living wages.
3. Sawyers at small mills usually do not know how to cut logs for quality.

Failure of the small mill means more than a direct loss of invested labor and capital to the mill owner. There is often times a loss of labor and the payroll of all those directly employed. The economic and social losses extend even out beyond the radius of the forest industries themselves. Industries that are dependent

upon the survival and operation of the many small forest industry units, may succumb after their departure, the tax base may be reduced, and the local rates must be higher on the remaining property. Tax receipts of local political units fall and many become bankrupt. Outside contributions for local governmental activities may become necessary. The standards of community life in schools, churches, roads, etc. are lowered. The population necessarily becomes shifting and labor, transient. All possibility of a balanced economic and social structure to which productive forest land and permanent forest industries should contribute may be lost.

Mill moving. A good example of a lack of foresight on the parts of mill owners can be cited in the case of mill owner number (22). This operator, in February, was setting up his mill at a site from which only 100,000 board feet of hardwood timber would be available. The mill had a possible capacity of 6000 feet per day, and it was thought that an average of 3000 feet or better per day would be made. In few words, the mill was setting up for a 30-day run of hardwood timber. Mill owner number (13) stated that it cost him $1,000.00 to move his mill to its present location. This mill has a 12,000 board feet capacity. It appears from this that even though the mill belonging to (22) is small, the cost of moving it and setting it up in its present location, amounts to

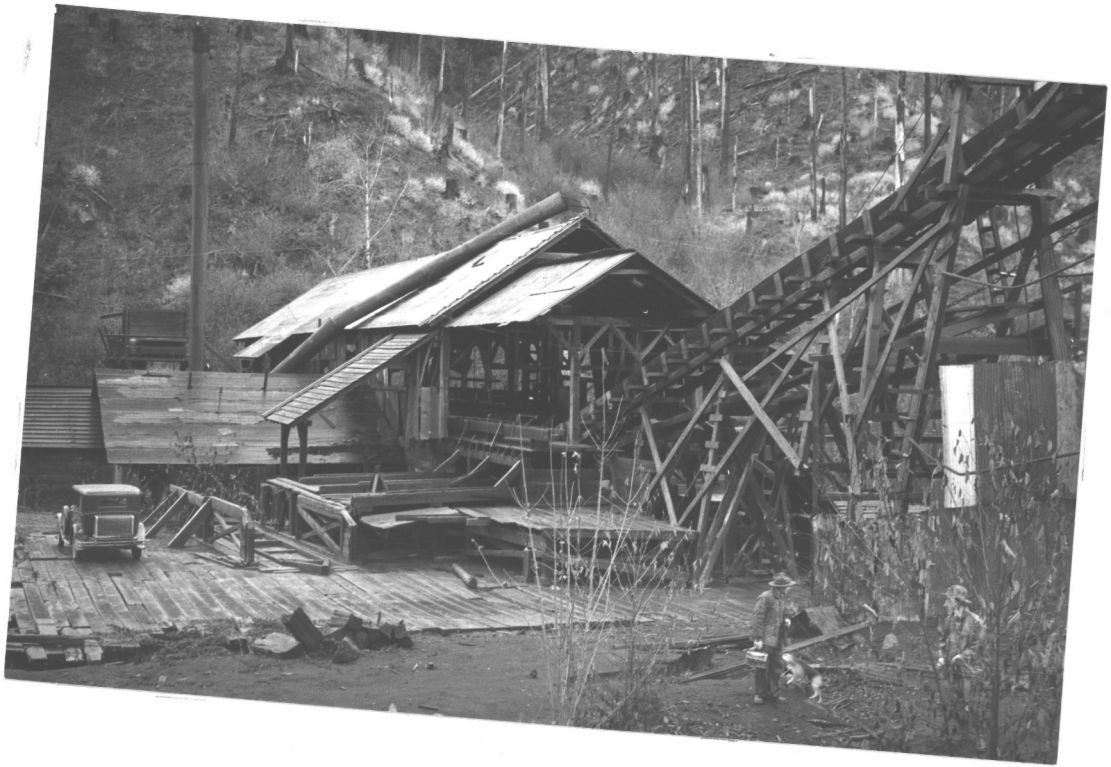
quite an item and probably for only 30 days' run, the expense does not justify its being moved to its present location. (The writers were unable to get figures of cost for moving the mill belonging to mill owner number (22).

The "come by day and fly by night" policy. In the following discussion, the authors are purposely omitting the names or numbers of mill owners because of the slanderous nature of some of the facts mentioned.

As before stated, according to the testimony of an authority on small mills, 75 per cent of these manufacturing plants started, close out of business within three years after beginning. This factor more or less gives them the name and reputation of being "come by day and fly by night" concerns. Unfortunately this is an undeniable truth in many instances. The writers, in talking with several of the mill owners throughout the county were impressed by the owner's opinion of the importance of their concerns to the community. One mill owner, for example, stated that, before his mill started in 1935, the entire village near which his mill is situated was on relief, that he had taken most of these men from the relief rolls and put the community on its feet again.

After hearing several of such stories, the authors decided that, perhaps, the stories were biased, so inquired of many of the help, local people, and business men of the community. "Yes," stated one mill worker,

FIGURE 10



One of the many mills that fail

"he took some of us off from relief. The only difference is that we are working and starving instead of just starving. I was offered $3.00 per day to come here to work. Sometimes I get $5.00 per week. I have no choice but to stick by it."

The mill owner who had taken the entire community off from the rolls of relief was buying his stumpage locally for a price of $.50 per 1000 board feet. The logging was in timber that averaged around 20 inches in diameter, and the mill owner was buying on the basis of the Doyle Rule, a rule noted for its inaccuracy in scaling small timber too small.

A local farmer stated that, during the winter, he had worked in a mill two miles distance from his house, walked to and from work for $1.50 per day and part of the time was unable to collect his pay. The farmer had six children and depended upon two cows, a few chickens, and what odd jobs he could get for support. The farmer also stated that another laborer and himself has spent two weeks falling for a mill owner, had run up a total bill of $50.00, and were unable to collect.

A business man in one community said, "Yes, I know all of the little mills around the country here and I can remember most of those that have been here, for in most instances, I still have their accounts on my books." When asked what he considered the reason for failure of

the larger majority of the small mills, he stated that usually the men who started them up were of the type that could not make a success of any business, no matter what they tried.

Living conditions of mill help. Living conditions of the average of the mill help were acceptable. In a few instances, however, the authors could not help noticing that they were most squalid. In one instance--the worst noted--a mill worker, his wife, and daughter of high school age were living in a house consisting of only one room. The walls were unplastered and cracks showed light through from the outside. Windows were cut in the house, but no panes of glass were present. In order to keep out the January winds and rain, rags, old sweaters, and towels had been hung over the windows. Thus the only light that entered the house was what filtered through the cloths over the windows and through the cracks in the wall.